



**United States Department of Agriculture**  
Forest Service

# **Francis Marion National Forest**

## **Draft Forest Plan Assessment**

**Francis Marion National Forest, Berkeley and Charleston Counties, South Carolina**

### **Section 10\_Renewable and Nonrenewable Energy and Mineral Resources**

**December 2013**

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**Francis Marion National Forest  
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Berkeley and Charleston Counties, South Carolina**

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# 10 Renewable and Nonrenewable Energy and Mineral Resources

## 10.1.1.1 Preliminary Findings

1. **Renewable Energy:** While the State of South Carolina is looking into various sources of renewable energy, the Francis Marion has the potential to provide woody biomass. Today, due to growth, wood products on the Francis Marion National Forest can be sold for more valuable products, such as sawlogs or pulp. Currently, the Forest is looking at opportunities to sell logging debris to create torrefied material similar to coal.
2. **Minerals:** The Forest has the potential to sell salable minerals, such as limestone, sand, or gravel, but a suitability analysis should be completed to determine where it would be appropriate to allow mining for these mineral products. There is very low potential to develop locatable or leasable minerals.

## 10.1.1.2 Introduction

Per direction 36 CFR 219.6(b), the responsible official shall identify and evaluate available information for the Forest for renewable and nonrenewable energy and minerals resources. Coordination with the Bureau of Land Management (BLM) on energy and minerals resources may be needed. The 1996 Forest plan does not make the “land available for leasing decision” or the “leasing decision” due to low potential for oil and gas occurrence and the lack of industry interest at that time.

## 10.1.1.3 Existing Information

Information regarding renewable and nonrenewable energy and mineral resources for the plan area can be found in documents from the following agencies:

### Sources of information on Renewable Energy in South Carolina

- South Carolina Department of Energy [<http://www.energy.sc.gov>]
- South Carolina Forestry Commission
- U.S. Department of Energy [<http://www.eere.energy.gov/>]

### Sources of information on Earthquake Hazards in South Carolina

- South Carolina Emergency Management System [[www.scemd.org](http://www.scemd.org)]
- University of South Carolina Seismic Network [<http://scsn.seis.sc.edu/>]
- South Carolina State Geologist’s Office, South Carolina Department of Natural Resources [[www.dnr.sc.gov/geology/earthquake.htm](http://www.dnr.sc.gov/geology/earthquake.htm)]
- U.S. Geological Survey information on South Carolina [<http://earthquakes.usgs.gov/regional/states>]
- Picture Collection of 1886 Charleston Earthquake [[http://eas.slu.edu/Earthquake\\_center/1886EQ](http://eas.slu.edu/Earthquake_center/1886EQ)]

### Sources of Information on Mining in South Carolina

- South Carolina Department of Health and Environmental Control, Mining and Reclamation [<http://www.scdhec.gov/environment/lwm/html/mining.htm>]

- South Carolina Department of Health and Environmental Control, Ocean & Coastal Resource Management [<http://www.scdhec.gov/environment/ocrm/czmp.htm>]

The following laws and regulations pertain to renewable and nonrenewable energy and mineral resources:

- Minerals (Subpart A–Locatable Minerals, Subpart B–Leasable Minerals, Subpart C–Disposal of Mineral Materials, Subpart D–Miscellaneous Minerals Provisions, Subpart E–Oil and Gas Resources) (36 CFR 228)
- Land Uses (36 CFR 251)
- Land Withdrawals (43 CFR 2300)
- General Mining Law of 1872 (as amended)
- Mineral Leasing Act of 1920 (as amended)
- Materials Act of 1947 (as amended)

The following Forest Service manuals (FSMs) and regional supplements pertain to renewable and nonrenewable energy and mineral resources:

- FSM 2760–Withdrawals
- FSM 2800–Minerals and Geology

To ensure that the best available science on renewable energy development was used, the South Carolina department of energy was contacted about on-going efforts to develop renewable energy in South Carolina. Local databases were reviewed for information on nonrenewable energy and minerals management on the Francis Marion National Forest. Information on earthquake hazard in South Carolina was obtained from South Carolina Department of Natural Resources, U.S.C. Department of Earth & Ocean Sciences, and South Carolina Geologic Survey.

#### 10.1.1.4 Current Conditions and Trends

##### Forest Plan Direction on Minerals and Energy

There is no Forest plan direction specific to the development of renewable energy, but some language on forest products is relevant to developing wood biomass. Objective O-9 in the Forest plan states, “Create conditions on 38,000 to 50,000 acres of pine stands which release overcrowded live crowns, increase residual stand growth potential, allow more sunlight to the forest floor and increase suitable habitat for the red-cockaded woodpecker.”

The 1996 Forest plan does not make the “land available for leasing decision” or the “leasing decision” due to low potential for oil and gas occurrence and the lack of industry interest at that time. the desired future condition for nonrenewable energy and minerals in the 1996 Francis Marion Forest Plan includes, “The landscape of the Forest shows some signs of mineral activity. Since the potential for oil and gas resources in the Atlantic coastal plain is low, most signs of activity are from gravel and sand pits, ceramic, heavy metal and pigment operations.”

There is some direction by management area.

- **Management Area 2 Wilderness:** Standard MA2-8: No mineral extraction will be allowed.

- **Management Area 8 Special Areas:** Standard MA8-1: Special use permits are allowed for activities that are consistent with maintaining the value of each scenic area.

### Renewable Energy

Renewable energy includes biomass, wind, solar, ocean power, geothermal, and hydroelectric energy. Currently, there is limited renewable energy being produced on the Francis Marion. At the administrative office, ground-source heat pumps are used to reduce energy costs. At some remote sites, solar photovoltaic batteries are used. Firewood permits are sold to the public for personal use.

A 2007 study reviewed mature, commercial, and emerging technologies (GDS Associates, Inc. and La Capra Associates 2007). Some of the renewable energy resources reviewed in these studies include: wood biomass, wind, solar, tidal, geothermal, and hydroelectric energy. GDS Associates, Inc. and La Capra Associates (2007) conclude their report with these findings: “The biggest contributor to renewable energy production would derive from biomass (landfill gas, wood, agricultural by-products). The next would be hydro. Offshore wind may become a large contributor if projects can be permitted.”

As a follow-up to this 2007 study, the South Carolina Department of Energy commissioned two studies to research the potential development of off-shore wind and other renewable energy options in the State (Colbert-Busch et al. 2012; Black and Veatch 2012). While these studies reviewed the potential to develop renewable energy technologies using solar, wind, ocean power, geothermal (ground source heat pump) agricultural resources, organic waste resources, waste oil resources, landfill gas, the findings on these resources are not reported here since they do have any potential for commercial development on the Francis Marion. Wood biomass and small hydropower or micro-hydropower are the only renewable energy technologies discussed in this section of the assessment.

**Wood Biomass.** GDS Associates and La Capra Associates (2007) noted that the use of wood in direct-fired boilers for electricity generation is a well-established technology. For the 2007 report, the authors assumed that direct-fire biomass facilities would use a mix of wood biomass, urban wood waste and agricultural by-products to generate electricity.

The 2004 Integrated Resource Review recognized the opportunity for biomass sales which have now been implemented. Over the last 10 years the Forest used seven stewardship contracts to develop wood biomass opportunities and reduce fuel loading in the wildland-urban interface. The Forest thinned small-diameter woody materials (2 to 8.5 inches) from post-Hugo regeneration located along major highways and near Charleston, where prescribed burning is restricted due to smoke management concerns. Approximately 283,615 tons of woody material was sold to generate electricity at a local mill.

Today, due to growth, wood products on the Francis Marion National Forest can be sold for more valuable products, such as sawlogs or pulp. However the Forest is looking at opportunities to sell logging debris to create torrefied material similar to coal.

**Small Hydroelectric.** Most of the conventional hydroelectric potential (with impoundments) in the State has already been developed. There is limited potential to develop sites for small hydro (1–30 Mwa) run-of-river projects (without impoundments) on the Francis Marion (U.S. DOE 2006). The Francis Marion has not received any requests to develop a small or micro-hydroelectric facility.

## **Trends and Drivers**

Currently, the potential to develop renewable energy for many technologies on the Francis Marion is non-existent to low, except for wood biomass and possibly small hydroelectric or micro-hydroelectric, which does not require impoundments.

The demand for renewable energy is closely linked to the price of fossil fuels, legislative requirements, and tax incentives. Wood biomass has been used for many years as a by-product of logging operations and continues to be a valuable commodity. The trend for this product is tied closely to the productivity of the logging industry; but biomass energy has not shown that it can stand alone as a strictly renewable energy resource. An emerging technology that was not assessed in the GDS Associates and La Capra (2007) report and may have some potential in the future is biomass gasification. Gasification costs need to be reduced and gasification issues resolved before being competitive with more mature technologies that can utilize wood biomass.

Selling woody biomass has the potential to provide revenue to the local economy through electricity generation and other value added products, and as a result contribute to social and economic sustainability. See section 6 “Social and Economic Assessment” for additional discussion on how the Francis Marion National Forest contributes to social and economic sustainability. Some organic matter is removed from the logging site, which could have some impacts to soil productivity and therefore some impact to ecological sustainability.

## **Nonrenewable Energy**

Nonrenewable energy resources consist of coal, oil, and natural gas. There are no oil, coal, or natural gas developments on the Francis Marion National Forest and the potential to develop these sources on the Forest is non-existent with current technology. See section 10 “Renewable and Nonrenewable Energy and Mineral Resources” for more details.

## **Minerals**

The Francis Marion has no mineral activity at the present time. With respect to National Forest management, mineral resources are divided into three groups: (1) locatable minerals, (2) leasable minerals, and (3) salable minerals. The authority of the Forest Service to influence and regulate the exploration, development, and production phases of mining operations varies with each group. Therefore, the Forest Service manages mineral resource programs that are specific to each group.

**Locatable Minerals.** Locatable minerals are those valuable deposits subject to exploration and development under the General Mining Law of 1872 (as amended). These resources are commonly referred to as hard-rock minerals and include gold, silver, and copper.

The General Mining Law of 1872 grants every U.S. citizen the right to prospect and explore lands reserved from the public domain and open to mineral entry. The right of access is guaranteed and is not a Forest Service discretionary action.

By law, certain lands—such as lands withdrawn by an act of Congress (e.g., through the Wilderness Act of 1964 or the Wild and Scenic Rivers Act of 1968) or lands withdrawn by an order of the Secretary of the Interior—are withdrawn from mining claim location. These withdrawn areas are, however, subject to mining claims with valid existing rights established before the date the areas were withdrawn from mineral entry. As a consequence, some mining claims located within existing or proposed withdrawn areas could be developed in the future.



Upon discovering a valuable mineral deposit, citizens have the right to locate a mining claim and remove the mineral resources. The citizen holding a mining claim is the claimant and is responsible for initiating mining activities and investing the capital required to conduct mineral exploration, site development, mine operation, and reclamation of the site.

The Forest Service works with mining claimants to provide reasonable access to their claims, minimize adverse environmental impacts on surface resources, and ensure reasonable reclamation of lands affected by mining operations. To protect surface resources, the Forest Service reviews the mining plan of operations submitted by the claimant; discloses impacts of the proposed mining operations in a site-specific environmental document; approves only those activities that are reasonably necessary for the proposed operation; monitors operations to ensure environmental standards are met; and ensures prompt and reasonable reclamation of disturbed areas.

No known deposits of gold, silver, or copper occur on the Francis Marion National Forest. There are no known outstanding mineral rights. Across the Francis Marion there are no approved plans of operations for various small lode and placer mining sites; there is no approved exploration activity investigating larger deposits. Any person proposing to conduct operations that might significantly disturb surface resources must submit a notice of intent to operate. The Forest has not received any such notices.

**Leasable Minerals (Oil and Gas).** Certain types of minerals, primarily energy resources, are not subject to mining claim location, but are available for exploration and development under provisions of the Mineral Leasing Act of 1920 (as amended). Access to these types of minerals is provided through leases, permits, or licenses that include fee and/or royalty payment conditions. Federally owned leasable minerals include oil, gas, coal, geothermal resources, potassium, sodium, phosphates, oil shale, sulfur, and locatable minerals on lands that have been acquired and are no longer considered public domain lands.

The BLM retains the authority to manage these minerals. The BLM is statutorily required to obtain consent from the Forest Service before issuing leases for leasable minerals on national forest system lands.

By regulation (36 CFR 228.102) certain lands are legally unavailable for leasing: lands withdrawn from mineral leasing by an act of Congress or by the Secretary of the Interior; lands recommended for wilderness allocation by the Secretary of Agriculture; and lands designated by statute as wilderness study areas (unless oil and gas leasing is specifically allowed by the statute designating the study area).

No potential for oil, coal, or natural gas development is known on the Francis Marion National Forest. This lack of potential is due in part because there is no triassic basin in South Carolina. Hydrofracking may make development possible for oil if it is determined that there are unmetamorphosed shale formations under the Francis Marion. However, these shale formations are typically found in the mountains and not in the coastal plains. The potential is expected to remain low to non-existent. There are no leases or have been any leases in the past. There may be some tracts with a minor royalty interest.

**Mineral Materials.** Often referred to as salable minerals, or common variety minerals, mineral materials are subject to the Materials Act of 1947 (as amended). These minerals are disposed of by sale, through issuance of free-use permits, or under contracts for in-service needs. Mineral materials may include petrified wood and common varieties of sand, rock, stone, cinders, gravel,

pumice, clay, and other similar materials. Such common-variety mineral materials include deposits that tend to be relatively widely available; although they have economic value, they do not have a distinct and special value. These minerals are most commonly used as building, landscaping, and construction materials.

South Carolina Department of Health and Environmental Control's Mining and Reclamation Section conducts the administrative and technical review on all applications for mining permits. The time spent conducting the review depends on the type of permit, complexity of the proposed operation, potential for environmental impact, and proposed reclamation (SCDHEC 2013a).

Berkeley and Charleston counties are covered by the South Carolina Coastal Zone Management Program. The South Carolina Coastal Management Program was established under the guidelines of the national Coastal Zone Management Act (1972) as a state-Federal partnership to comprehensively manage coastal resources. It was authorized in 1977 under South Carolina's Coastal Tidelands and Wetlands Act with the goal of achieving balance between the appropriate use, development, and conservation of coastal resources in the best interest of all citizens of the state (SCDHEC 2013b).

DHEC's Office of Ocean and Coastal Resource Management is the designated State coastal management agency responsible for the implementation of the State's Coastal Management Program. Implementation includes the direct regulation of impacts to coastal resources within the critical areas of the State including coastal waters, tidelands, beaches and beach dune systems; and indirect certification authority over Federal actions and State permit decisions within the eight coastal counties. All mining permits in S.C. Coastal Zone Area must be certified by SCDHEC's Office of Ocean and Coastal Resource Management as being consistent with the S.C. Coastal Zone Management Act (SCHDEC 2013a).

While there are no mineral operations occurring on the Francis Marion, there is potential for two salable products: limestone and sand.

*Limestone:* Currently Martin Marietta is mining limestone near Jamestown. The company is producing products for road base and agricultural fertilization, which are considerable salable mineral products. In the past the Forest has received proposals for mining limestone. Each proposal was turned down for various reasons. Since the Agency could only give a 5-year minerals material contract, the inquirers have not pursued it further. While the Gulliard Lake Scenic Area has limestone, it is protected from mining as a Forest-designated scenic area.

*Sand:* There is the potential for dredging sand from rivers. A special use permit from the Forest Service may be needed, depending on who owns the river bed. On larger rivers, the State owns the river bed and the South Carolina Department of Health and Environmental Control would process the sand dredging permit. On smaller rivers, where the river bed is national forest land, the permit would have to be approved by the Forest Service. No requests have been received by the Francis Marion National Forest to develop sand dredging operations.

### **Trends and Drivers**

The housing industry impacts the amount of mineral materials sold in the higher-population centers of the Francis Marion. Growth in the Charleston and Georgetown areas is expected to continue. As new houses are built and the demand for road or building materials increases, the demand for limestone or sand materials may increase.

From past evaluations, mineral activities in the Dutart Creek vicinity on private lands may be impacting ground water or could be causing land subsidence. However, the Forest has not been monitoring these impacts. Other mining issues are presenting themselves on a piecemeal basis on the edge of the Forest that may have impacts in the future.

Making mineral material available, such as limestone or sand, has the potential to provide revenue to the local economy and contribute to social and economic sustainability. See section 6 “Social and Economic Assessment” for additional discussion on how the Francis Marion National Forest contributes to social and economic sustainability. Mining does remove resources from the site, and therefore has the potential to impact ecological sustainability. Any mineral operations on national forest land would require a site plan that would limit impacts to the environment and limit impacts to ecological sustainability to the immediate area.

### Geologic Hazard

It is too deep to bedrock for radon, methane, asbestos, erionite to pose any health risks. There are no known risks from landslides, mud flows, debris flows due to the flat topography. There are no known potential for volcanoes or karst collapse in the coastal plain area of South Carolina. Flooding is discussed in section 3 “Additional System Drivers.” Earthquakes risks are discussed below.

Most of South Carolina’s earthquakes occur in the Coastal Plain where the underlying rock is very faulted or broken from the break-up of the plates. Approximately 70 percent of the earthquakes in South Carolina occur in the Coastal Plain, with most clustered around three areas of the State: Ravenel-Adams Run-Hollywood, Middleton Place-Summerville, and Bowman (SCDNR 2013).

Geologically, Charleston and the Francis Marion National Forest fall in one of the most seismically active areas in the eastern U.S. On August 31, 1886, a magnitude 7.3 earth quake shook the Charleston area. This is the most damaging earthquake to occur in the southeast United States and one of the largest historic shocks in eastern North America (USGS 2013).

The seismicity clusters around the cities of Summerville and Bowman, known as the Middleton Place-Summerville Seismic Zone) (SCDNR 2013). This seismic activity is believed to be caused by two faults: Woodstock and Ashley River. The Woodstock Fault, which runs through it, has been active for thousands of years, and will likely be active for thousands more. The Francis Marion National Forest is located in this zone.

Since 1886, there have been a number of medium-sized (and thousands of small) earthquakes in South Carolina. The Middleton Place-Summerville Seismic Zone experiences between 10 to 15 earthquakes every year, but the majority have been less 3.0 in magnitude and therefore do not attract much attention (U.S.C. 2013; SCDNR 2013). The average time between catastrophic earthquakes is approximately 500 to 550 years. However, this does not give any prediction of when the next catastrophic earthquake will strike.

Potential secondary effects of an earthquake include landslides, soil liquefaction, and fire (SCDNR 2013).

**Landslides.** Landslides occur in hilly/mountainous region and are not a risk on the Francis Marion due to the flat topography.

**Soil Liquefaction.** Movement caused by earthquake forces water to seep into the material beneath a building. The saturated granular material can lose its strength and briefly change from a solid into a liquid. When this occurs, the foundations of building will become unstable and sink into the ground (SCDNR 2013). There are some potential liquefaction areas noted on the Francis Marion National on the geologic hazard map for South Carolina (SCDNR 1996). This risk of soil liquefaction varies with the magnitude and epicenter of the earthquake and cannot be predicted for the Francis Marion.

**Fires.** The movement from earthquakes can rupture gasoline and natural gas pipes or damage electrical lines, which can cause fire. In addition, the earthquakes can disrupt water service making it more difficult to fight fires. The risk of fire outbreaks varies with the magnitude and epicenter of the earthquake and cannot be predicted for the Francis Marion.

#### Transmission Corridors

The Forest has transmission corridors, and numerous powerlines to homes and businesses in the area. It is highly likely that transmission corridors would be developed in the future and would most likely follow U.S. Highway 17, I-526, or I-26.

Table 10.1.1.4 Miles of Rights-of-Ways on the Francis Marion National Forest (Source:GIS data)

Type	Mileage
Electric	56.2
Gas	27.3
Other	3.9
<b>Grand Total</b>	<b>87.4</b>

#### 10.1.1.5 Information Needs

The minerals program has a need for the acreages of leasable lands, locatable lands, and lands with outstanding mineral rights. The minerals program also needs an inventory of abandoned quarries and gravel pits located on the Forest. The issue is increasing demand for sand and limestone on the Forest and what and where (if at all) this use should be allowed. A geologic suitability analysis needs to be completed to determine the suitability of the Forest to supply minerals, oil, and natural gas.